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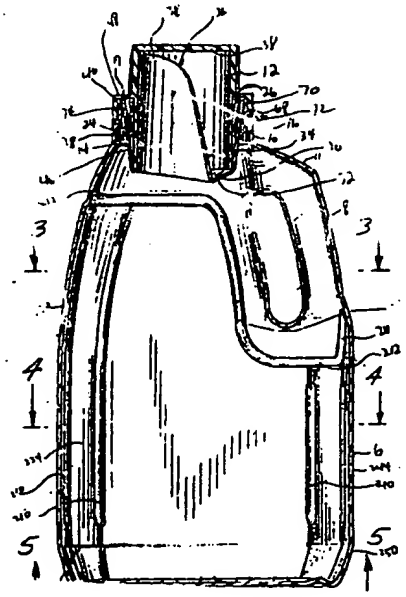
(54) **BOUTEILLE**
(54) **BOTTLE**



(57) Cette invention concerne un contenant léger particulièrement utile pour le stockage de produits ménagers tels que détergents liquides forts.L'objet de l'invention permet une économie de matière première et réduit la quantité de plastique à éliminer dans les opérations de recyclage sanitaire. Le corps du contenant comporte de 6 à 10 côtés et il a une structure multi-couches en résine de synthèse. Il peut comporter des

(57) A container having a lightweight bottle body, especially useful for liquid household products such as heavy duty liquid detergents. The light weight of the body limits the amount of resource needed to produce the body and the amount of plastic material to be disposed of when the contents have been consumed. The body includes from 6-10 side panels, and a multilayer resin structure. Ribs or grooves at the intersections of the

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nervures ou des rainures de renfort aux points de jonction, une collerette anti-gouttes, un goulot décentré et une étiquette moulée dans la masse. Une structure multi-couches en résine de synthèse est privilégiée, la couche intérieure étant en résine à haute résistance à la fissuration sous contrainte en milieu solvant et la couche extérieure en résine haute densité à rigidité accrue. Le contenant peut aussi servir pour des assouplisseurs de tissu, des détergents pour tissus délicats, des gels et liquides détergents pour lave-vaisselle automatique, des produits chimiques et des produits alimentaires.

panels, a drainback fitment, an off center neck, an in-mold label are optional. A multilayer resin structure having high ESCR resin on the inside and/or a high density, more rigid resin on the outside is preferred. The container may also be used for liquid fabric softeners, liquid and gelled automatic dishwashing detergents, light duty detergents, chemicals and foods.

ABSTRACT

A container having a lightweight bottle body, especially useful for liquid household products such as heavy duty liquid detergents. The light weight of the body limits the amount of resource needed to produce the body and the amount of plastic material to be disposed of when the contents have been consumed. The body includes from 6-10 side panels, and a multilayer resin structure. Ribs or grooves at the intersections of the panels, a drainback fitment, an off center neck, an in-mold label are optional. A multilayer resin structure having high ESCR resin on the inside and/or a high density, more rigid resin on the outside is preferred. The container may also be used for liquid fabric softeners, liquid and gelled automatic dishwashing detergents, light duty detergents, chemicals and foods.

BOTTLE

Background of the Invention

One popular form of laundry detergent is the heavy duty laundry liquid. Its popularity is due in part to the convenience of the product form, in particular the ability to apply the detergent readily to soiled areas of the clothes. The popularity of laundry liquids has created a need for more convenient containers for dispensing these products. Thus, bottles having measuring cups serving as closures, and fitments incorporating drainage mechanisms and pouring spouts have appeared on the market.

One type of container is exemplified by that of Barker U.S. Patent No. 4,550,862 wherein a bottle includes a fitment having a spout and a structure permitting the product to drain back into the container. The fitment has internal threads at its upper aspects which mate with external threads surrounding the mouth of a bottle closure. The threads at the mouth of the closure mate with their counterparts at the upper aspects of the fitment, the cup does not extend very far into the fitment, and the drainback region of the fitment can be shallow.

Other containers have been developed using a different approach. The container disclosed in Davidson et al. U.S. Patent No. 5,108,009 comprises a spout- and drainback-including fitment which snaps into the mouth of the bottle. The closure has internal threads situated within a flange which surrounds the measuring cup portion of the closure. The internal threads of the closure mate with external threads surrounding the neck opening.

While consumers appreciate the benefits of modern liquid detergent containers having measuring closures and drainback fitments, these sophisticated packages are not without their cost. Many of these containers include three seperate parts, a body, a fitment and a closure. These components are typically made of plastic and each requires a certain amount of plastic to perform its structural function.

The amount of plastic material used in making liquid detergent containers, also should be considered from an environmental standpoint. It would be desirable to minimize the amount of such materials so that in those cases where the package is not recycled a smaller amount of plastic material reaches the landfill or other disposal area. Also it is desirable to develop a structure which can utilize a significant amount of recycled material.

Plysu of Great Britain sells and illustrates in a brochure ultra light weight bottles under the name Paklite. Its 5 liter bottle weights 90 grams (0.53 g per fluid oz.). The bottles have a handle, eight panels, include vertical grooves extending most of the height of the panel at eight corners and have waffles in the bottom. Plysu also holds British registered design 2033440 which illustrates their bottle.

Robbins US Patent No. 4,890,757 discloses an enclosure having self supporting side walls formed of a plurality of spaced ribs with non self supporting thin webs therebetween.

Chochran US Patent NO. 4,949,801 discloses a thin wall blow molded plastic container including a body, a neck support member 20 and lateral support members 18.

NL 9201806 discloses a bottle having a handle, a reinforcing profiled bottom, and a reinforcing groove (14).

CA 2164914 is directed to a bottle provided with a handle and a bottom having waffle-like grooves.

German Gebrauchsmuster 9212023 is directed to a thin walled bottle having an octagonal shape, a handle and grooves.

DE 31 39 083 discloses a bottle having a handle and provided with various reinforcing grooves.

German Gebrauchsmuster 29503460 discloses a bottle having grooves running around the top, body and bottom of the bottle.

EP 624 137 is directed to a thin walled bottle having side walls textured to 0.05 to 0.15 mm. US 5,522,519 appears to be an equivalent.

GB 2 042 408 discloses a bottle of saturated polyester resin having an opaque and matt surface.

EP 322 651 is directed to a bottle having reinforcing vertically extending ribs (76).

EP 198 587 is directed to a bottle having various reinforcing grooves.

Kalkanis US Patent No. 5,469,984 discloses a thermoplastic container having an anti-bulging base with a flat ring-shaped section and a central dome-shaped section.

It is known to adhere a bottle label to the bottle in the mold.

Jabarin US Patent No. 4,567,069 discloses blow molded polymeric containers said to have good physical properties and good resistance to envirnomental stress cracking. The walls and bottom of the container are fabricated from a multilayer polymeric material. A thin inner wall is fabricated from a linear low density ethylene polymer. The thicker outer wall is fabricated from a linear high density ethylene polymer. The material will generally contain two layers, but for special applications three or more may be used. The linear high density ethylene polymers will have a density of at least about 0.94 gm/ml, preferably at least 0.95 and more especially at least about 0.96 as containers prepared from such resins are said to have greater stiffness. It is said that somewhat thinner containers can be employed with no loss of stiffness.

Strassheimer US Patent No. 4,785,348 illustrates a container with a hexagonal section. The patent is directed to bottles with thickened portions extending completely circumferentially around the periphery.

Yoshino US 5,080,244 discloses a synthetic resin thin walled bottle having ribs at least at its bottom portion.

Jakobsen US 4,359,165 discloses a reinforced thermoplastic container having internal reinforcing ribs.

Yoshino US 4,620,639 discloses synthetic resin, thin walled bottles having ribs at least at the bottom. Ribs extending the full axial length of the barrel portion, whereby buckling strength is said greatly to be increased, are disclosed in Fig. 6.

Evers US 3,029,963 discloses a bottle with vertically extending ribs.

LaFleur US 5,224,623 discloses a fast food container reinforced by ribs which wrap around the container side walls.

Other containers are illustrated in Rogler et al. US Des. 353,541, Ring US Des. 351,347, Ring US Des. 348,612, Darr et al. US Des. 332,747, Jacobs US Des. 300,005, Visser US Des. 272,318, Platte US Des. 265,797, Kaplan US Des. 192,886, Price US Des 195,697, Lyons US Des. 286,379, Gonda US Des. 305,407, Chambers US Des. 306,410, Davis US Des. 311,864, Carmine US Des. 312,964, Fiore et al. US Des. 321,624, Beechuk et al. US Des. 326,052, Baird et al. US 4,846,359, Krall et al. US 5,232,107, Mallin US 3,385,461 and WO 94/25350.

Summary of the Invention

The present invention is directed to improved packages for dispensing liquid household products such as liquid detergents and liquid fabric softeners. The package comprises a downwardly extending body having from 6-10 axially extending side panels fabricated from multiple polymer layers. The packages preferably are in the form of a bottle having a drainback fitment. Advantageously, the bottle is lightweight, thereby conserving valuable resources and minimizing waste, but at the same time is functional as a heavy duty liquid detergent dispenser. Also the bottle may be used to contain fabric softeners, light duty (eg, hand dishwashing) liquid detergents and liquid and gelled automatic dishwashing detergents.

In preferred embodiments, the octagonal or other polygonal shape and multilayer resin structure, are combined with other features to form a lightweight bottle suitable for use as a heavy duty liquid detergent container. Among these

other, optional, features are grooves or ribs on at least 50% of the corners where the side panels intersect, an in-mold label, an increased finish diameter ranging from about 50 to about 88 mm, especially from 51 to 77 mm, and an off centered neck. The pour spout preferably has a bottom wall with a product drainage aperture. The grooves or ribs, if present, preferably extend axially at least 60% of the distance along the intersections of the panels. An optional tapered base panel extends from the side panels to the bottle base.

Pouring of product from the container is believed to be faciliated in the present combination of light weight and off-centered neck.

The lighter weight of the body of the bottle and the finish make the bottle less expensive and more sparing of valuable resources. Moreover, less plastic material needs to be recycled or disposed of in the landfill or otherwise. Bottles according to the invention weigh approximately 20-50% less than bottles traditionally used to contain heavy duty liquids. Preferably the bottle of the invention (exclusive of the fitment and the closure) weighs less than 1.2 gram per fluid oz of capacity. Especially preferred is that the bottle weigh between 1 gram and 0.5 grams per fluid oz.

The bottles of the various embodiments of the invention may also include an optional handle or other integral gripping feature.

The multilayer bottle of the invention is advantageously fabricated with certain resins. A bottle having one or more of the following is preferred: an outer layer comprised of a high density resin, an inner stress crack resistant (ESCR)

layer, and a layer, preferably a middle layer, employing at least 25% recycled resin.

Still more preferred are bottles combining the resin structure with most of the features of the individual embodiments recited above.

For a more complete understanding of the above and other features and advantages of the invention, reference should be made to the following detailed description of preferred embodiments and to the accompanying drawings.

Brief Description of the Drawings

Figure 1 is a perspective view of a container of the invention with the closure fastened.
Figure 2 is a section along the lines 2-2 of Figure 1, except that the container additionally includes corner grooves.
Figure 3 is a section along the lines 3-3 of Figure 2.
Figure 4 is a section along the lines 4-4 of Figure 2.
Figure 5 is a bottom plan view along the lines 5-5 of Figure 2.
Figure 6 is a section along the lines 6-6 of Figure 5.
Figure 7 is a section along the lines 7-7 of Figure 5.
Figure 8 is a perspective view similar to Fig. 1 of a container of the invention having an in-mold label and corner grooves.

Detailed Description of the Invention

Referring now particularly to Figures 1 and 2, there is shown a container 2 including a bottle 6 having an integral handle 8 and a neck 10. The container 2 also includes a drainback fitment 14. Fastened to the top of the container

2, as viewed in Figure 1, there is a closure or cap 12. All of the foregoing components are preferably molded from a resilient flexible plastic material. The materials may be selected so that the plastic from which the drainback fitment 14 is molded is softer than the materials from which the bottle 6 and closure 12 are formed. Alternatively, the drainback fitment may be made of a material of comparable hardness to that of which the closure is made, e.g., polypropylene or HDPE.

The drainback fitment has an outer, frustoconical wall portion 16 which gradually tapers downwardly and inwardly and is received within the neck 10 of the bottle 6. The wall portion 16 terminates at its upper end in an annular rim 19. Rim 19 is generally flat.

The surface of the rim turns downwardly and inwardly to form the outer wall 24 of a circumferential well 26 surrounding a generally frustoconical, eccentrically positioned (off-center) spout 36, the lower periphery of which forms the inner wall 28 of the circumferential well 26. Between the outer wall 24 and inner wall 28 of the circumferential well 26 there is a sloping floor 30. The outer surface of wall 16 optionally includes a retaining ring which is spaced from and generally concentric with rim 19. Wall 16 may include a product exit aperture (or drain port) located above and spaced from the product drainage aperture 32. The basic features of the fitment, bottle finish and closure are as shown in Fig. 9 of Davidson et al. U.S. Patent No. 5,108,009, the disclosure of which patent is hereby incorporated by reference herein. An appropriate product drainage aperture is illustrated in more detail in Fig. 3 of Davidson et al.

The product drainage aperture or notch 32 preferably comprises a substantially rectangular notch formed in the lowest and widest portion of the floor 30 and is desirably in alignment with a longitudinal slot 34 which extends from the top of the rear of the spout. While the longitudinal slot may extend to the notch 32 and merge therewith (as shown in Figure 2), of the invention, if desired, the slot may extend only approximately halfway down the length of the spout.

The spout may include projections to keep the fitments separated during stacking. Such projections may also serve to prevent rotation of the spouts during stacking when combined with lugs (not shown) depending from the bottom of the fitment and situated so that they block radial movement of the stacking projections on the next lower fitment when the fitments are stacked.

Notch 32 and longitudinal slot 34 provide a path for residual liquid remaining on the spout 36 or closure 12 to drain back into the bottle 6 either directly or via the downwardly sloping floor 30 of the circumferential well 26 under the force of gravity when the container 2 is in an upright position.

Fitment 14 is secured to bottle finish 68 by a friction fit. Bottle finish 68 includes an annular mouth 70, and a locking ridge 72. The finish includes threads 74. The fitment is inserted into the bottle by forcing it through the opening at the bottle mouth and pushing it until annular rim 19 of the fitment is situated upon or above locking ridge 72. If rim 19 is above locking ridge 72, preferably it is immediately above. In this position, the distal end of the annular rim will be adjacent to bottle mouth 70.

Optionally, a retaining ring of the fitment helps to retain the fitment in position by abutting the lower aspects of locking ridge 72.

If desired, the spout 36 may be provided with an anti-drip lip. Also, it may be desirable to provide the spout with a V-shaped pouring angle for improved control of pouring of the product.

The drainback fitment 14 may be formed from a thermoplastic such as high density polyethylene. Or it may be made of a polyethylene which is a product of a 50:50 blend of a high density resin and a low density resin. The high density resin can be U.S.I. LS 506 or a similar resin. The low density resin can be U.S.I. LS 208 or the like. Instead of a mix of resins, a low density polyethylene such U.S.I. 241 or even a harder material such as polypropylene may be used to form the fitment. Other plastic resins having chemical and physical properties similar to the aforementioned resins can be used in fabricating the drainback fitment 14.

Preferably, the container of the invention provides the spout and drainback area in the form of the above described fitment, separate from the body of the bottle. In the described preferred embodiment, the fitment snaps into the container finish so that a friction fit is obtained between the outer wall of the fitment and a locking ridge on the inside of the container finish. A fitment may also be provided in other ways, eg it may be applied by spin welding, or by hot melt adhesive or by the EMABOND system. An internally threaded finish may be combined with an externally threaded closure.

The EMABOND system employs a thermoplastic gasket impregnated with metal particles. When the gasket is in

position (between a sealing area ridge of the fitment and inside bottle neck ledge), a sealing unit with an electro-magnetic force presses down on the fitment and heats up the metal particles, thereby melting the plastic gasket, and the compression welds the two components together with a leak-proof seal.

Although the fitment would normally be a separate piece, it may also be formed integral to the bottle. A threaded collar could then be spin welded onto the exterior of the bottle to mate with the threads of the closure.

It is also contemplated that some of the embodiments may be in the form of refill bottles which contain a plain screw cap and no spout but which are capable of receiving a transferable spout and self draining closure.

The closure 12 has a closed end 38 at its top which is merged at its circumference with a downwardly extending inner circumferential wall 46 having a surface onto which there are integrally molded gripping teeth 42 biased to present greater friction to the hand when the closure 12 is rotated counterclockwise to loosen it than when it is rotated clockwise for tightening. Alternatively, other gripping means, such as vertical ribbings may be employed.

The inner circumferential wall 46 is concentric with and spaced from an outer circumferential wall 40. Inner circumferential wall 46 extends downwardly beyond the length of the outer circumferential wall 40. The inner circumferential wall 46 and the undersurface of the closed end 38 form a cup for measuring the contents of the container 2 as it is poured from the bottle 6. A fill line can be molded into the inner circumference of the inner wall

if desired. Internal vertical lines closely spaced together can be provided to enhance the visibility of the fill line.

The outer circumferential wall 40 and inner circumferential wall 46 are connected by a web 48 so that a downwardly facing (when the closure 12 is fastened to the bottle 6) channel is defined between the inner circumferential wall 46 and the outer circumferential wall 40. The channel is optionally lined with a liner preferably made of a resilient, polymeric material. However, it is preferred that the channel be linerless. The channel in cooperation with the frustoconical wall portion 16 and optional liner serves as a trap for preventing residual contents of the container 2 from migrating to the junction of the closure 12 and neck 10 of the bottle 6. If desired the liner may be omitted.

Complimentary fastener means in the form of threads are provided on the closure 12 and neck 10 of the bottle 6 at their juncture. The closure 12 has internal threads 50 which mate with external threads 74 on the finish 68 of the bottle. As the closure 12 is threaded onto the neck 10 of the bottle 6, the liner, if present, engages the mouth 70 of the bottle 6 thereby sealing the bottle to prevent leakage of the contents from the container. When the liner is omitted, the top of the channel seals against the mouth 70 of the bottle. The presence of the fitment rim below the top of the finish permits the closure (or the liner of the closure) to form a seal at one point at the top of the finish. If the fitment rim extended over the top of the fitment there would be two areas for liquid product to escape through the seal, above and below the rim of the fitment.

The inside of the land of the bottle may be beveled to assist in sealing. The bevel imparts to the top of the mouth a sharp point from which the inner wall of the mouth slants inwardly. The outer wall of the mouth is disposed generally vertically. Whether the closure is on or off, the friction fit of fitment 14 against locking ridge 72 within the bottle finish 68 prevents escape of the product except through the spout, the drainage aperture or the product exit aperture. When the closure is screwed closed, product which has exited bottle 6 through the spout, drainage aperture or product exit aperture is contained within container 2 by the closure.

As is apparent from Figure 2, except for the spout, fitment 14 is wholly contained within the bottle 6. The entire outer wall 16 is situated below the mouth 70 of this bottle.

Although the fitment herein has been described as having a single product exit aperture, a plurality of apertures may be utilized.

In addition to serving to permit use of the last portion of the product, the product drainage aperture also serves as a vent hole as well. As such, it permits air to enter the container as product leaves through the spout.

The product exit aperture may assume any shape and size suitable for permitting exit of at least a portion of the last fraction of product trapped between the outside of the fitment and the wall of the bottle, e.g. triangular, rectangular or square, or may take the form of a slit. Preferably, the exit aperture is of a size and shape suitable for venting, as well. The product exit aperture is located high enough in the fitment wall such that at least a portion of liquid trapped when the bottle is turned upside

down can escape. The product exit aperture is described herein as being positioned approximately halfway down the wall of the fitment, although it may be located one quarter of the way down or three quarters of the way down or elsewhere, depending on the dimensions of the container.

While certain features such as the annular rim and the retaining ring have been illustrated and/or described as extending 360 degrees around the circumference of the fitment, it will be apparent that such will not always be necessary in order that their functions be fulfilled in accordance with the invention. For instance, the annular rim may be replaced by other stopping means and the retaining rim may be replaced by other retaining means. Stopping means refers to the annular rim and equivalent structures even in fitments and containers wherein the friction fit between the fitment wall 16 and the locking ridge 72 is sufficient to prevent the entire fitment from being pushed through and into the bottle.

The closure may be formed of a harder material than that used in the drainback fitment 14. In the preferred embodiment of the invention, the plastic material from which the closure 12 is molded is a homopolymer or copolymer polypropylene such as that sold by Phillips Petroleum Company under the designation Phillips HLV 120-01.

The bottle 6 also may be formed of a material that is harder than the material employed in the drainback fitment 14. Alternately, the fitment may be formed of a harder material, as where the fitment is fabricated from polypropylene. Materials from which the bottle may be fabricated include high density polyethylene. Or, another resin sold by U.S.I. under the designation .955 density, OI-388-2, is a suitable material. Other materials exhibiting similar chemical and

physical properties can be substituted. Preferably, however in accordance with certain embodiments of the invention, the bottle is made from multiple layers.

The bottle of the invention preferably is made of at least one resin layer, especially the inner layer, which possesses a good stress crack resistance, as determined according to ASTM D-1693-95. That is, the layer preferably has at least 75 hours, and more preferably at least 100 hours, most preferably at least 300 hours stress crack resistance under that test. Good stress crack resistance is promoted by the selection of resins having an appropriate distribution of chain lengths, especially distributions favoring long chain lengths. Stress crack resistance is important to the ability of the package to contain effectively its contents for prolonged periods of time on the shelf or in the consumer's cupboard. Polymer layers which have a lower MI (lower melt index) promote stress crack resistance, since they tend to have longer molecular chain lengths, and impact resistance, as well.

Preferably, the container also possesses a good drop strength resistance so that a water filled bottle will survive at least one 3-foot drop onto its base. The drop strength can be important to assure that the container can withstand the travails of packing, shipment, and use and storage by the consumer.

ASTM D1693-95 ESCR test results are believed to be good indications of whether a resin has good stress crack resistance. Resins which are understood to have good ASTM D1693-95 ESCR test results and which are therefore good candidates for the high ESCR layers of the invention include:

Paxon AC 45-004 (0.945 density); Marlex D252 (0.923 density) (Resin is called "low density, linear polyethylene on data sheet); Chevron 9503 (0.946 density); Chevron 9346 (0.9455 density) (pipe resin); Exact 3035 (MPE) (0.900 density, melt index of 3.5 dg/min (0.35)); Phillips D252 LLDPE (25% LLDPE/75% HDPE) (density 0.923; melt index 0.25). Exact 3035 is obtainable from Exxon.

The high stress crack resistant layer may be pigmented or non-pigmented.

It is further preferred that the density of the outer layer be higher, eg from 0.948 to 0.964. The optional middle layer may also be high density. The selection of a resin, such as a high density polyethylene having a density in the higher ranges (eg, 0.945 to 0.964 and above) will assist in making the container more resistant to top load pressure. Examples of materials which may be used include Paxon AU55-003, a medium molecular weight distribution high density polyethylene copolymer available from Paxon Polymer Company of Baton Rouge, LA, and Paxon AC45-004, a high density polyethylene copolymer available from Paxon Polymer Company. Either of the above may advantageously be used in conjunction with a percentage, say 25% of a recycled resin, i.e., a post-consumer recycled resin (PCR) such as a high density polyethylene bottle scrap. More preferred are the above materials used in conjunction with an inner layer of a blend such as linear low density polyethylene (LLDPE) and high density polyethylene (HDPE) at about 25%/75%.

Preferably, the container comprises panels having a multilayer structure including i) an outer higher density material, ii) an optional middle layer comprising a minimum of 25% recycled resin, and iii) an inner, lower density, lower MI layer. It is especially preferred that the

features of the individual or combined embodiments of the invention be present in a bottle fabricated from a multilayer structure including i) a high stress crack resistant virgin inner layer, ii) an optional second layer comprising a minimum of 25% recycled resin, and iii) a virgin resin outer layer. In accordance with another a still further aspect of the invention, the bottle is made from i) an outer higher density material, ii) an optional middle layer comprising a minimum of 25% recycled resin, and iii) an inner, lower density, lower MI layer. Recycled resin is preferably HDPE from used milk or water bottles and possibly used detergent bottles of about the same color.

Other advantageous combinations of multiple layers are possible, including I) i) an outer higher density material, ii) an optional middle layer which may include 25% or more recycled resin, and iii) an inner layer selected from the group consisting of a) high ESCR, virgin resin, b) a blend including recycled or virgin LLDPE, c) a metallocene polyethylene (MPE), or d) an MPE/HDPE blend. II.) high ESCR inner and outer layers, III.) high ESCR inner layer and outer layers and a foamed inner layer and, IV.) high ESCR inner and outer layers/rigid resin in outer and/or middle layer. Ranges of thicknesses preferred in a multilayer material would be 10-20% outer, 20-80% middle and 10-20% inner. A useful arrangement (percentage thickness) of layers would be 10% outer layer, 80% middle layer and 10% inner layer. Thickness may be measured in millimeters or mils (thousandths of an inch). Other advantageous resins include (low density linear polyethylene) LDLPE or a blend of LDLPE and HDPE.

Preferred multilayer structures also include a) lower density, high ESCR resins in the inner layer or with b) an

inner layer blend of 75% high ESCR/HDPE with 25% LLDPE. Containers made with such multilayers have been found to have advantageous impact resistance and stress crack resistance characteristics, especially when compared to typical, current household bottles which use the same resin for all 3 layers, not including the PCR content.

Especially preferred multilayer structures for the bottles comprise 1) outside layer (20%): Chevron polyethylene 9402; middle layer (70%): Chevron virgin 9402 PCR polyethylene homopolymer (employs recyled PE); inner layer (10%): Chevron 9301 polyethylene; or 2) outside layer (20%): Chevron polyethylene 9503 (20%); middle layer (70%): Chevron virgin 9402 PCR polyethylene homopolymer (employs recyled PE); inner layer (10%): Chevron 9301 polyethylene.

While trilayer structures (5-30% outer/60-90% middle/5-30% inner layers, particularly 10-20% outer/70-80% middle/10-20% inner layers) will generally be preferred, bilayer or monolayer structures may also be used. While it will generally be preferred that inner and outer layers be virgin (ie not recycled, resin), the inner layer may include some recycled resin. Where the inner layer includes recycled resin, one candidate will be blends containing LLDPE from recycled pallet stretch film. Other good candidates for the inner layer include LLDPE and LLDPE/HDPE blends, metallocene polyethylene (MPE) (e.g., Exxon's Exact) and MPE/HDPE blends. It will generally be preferred that middle layer include at least 25% PCR. A foamed HDPE middle layer may also be used. Other advantageous resins include (low density linear polyethylene) LDLPE or a blend of LDLPE and HDPE.

In accordance with the invention, the finished end or body of the bottle is lightweighted. That is, the finished end

or body is made of a material which is lighter in weight than standard materials from which heavy duty liquid detergent bottles are made. This permits less material to be used and results in less material to be disposed of after the contents of the bottle have been consumed.

Despite the lightweight of the bottle, and finish, the bottle enjoys good stress-crack resistance and preferably also, dent resistance and drop strength. compressive strength. Numerous features are believed to contribute to the structural strength of the bottle despite its lightweight.

On the front and side of the bottle, finish 10 of the body of the bottle leads to downwardly sloping shoulder 11. To the rear of the bottle, integral handle 8 extends backwardly and then downwardly. Wall 9 extends almost vertically from the finish behind and to the sides of the handle. Generally horizontal shoulder 13 is formed as a continuation of wall 9 in front of, and on either side of, the handle.

Extending downwardly from shoulder 11 are medial front panel 230, first and second lateral front panels 232 and 234, and first and second side panels 236 and 238. Portions of side panels 236 and 238 also extend from wall 9 and from horizontal shoulder 13. Extending downwardly from shoulder 13 are first and second lateral rear panels 240 and 242. Medial rear panel 244 also extends downwardly from shoulder 13, and in addition, from the bottom of handle 8.

Below panels 230, 232, 234, 236, 238, 240, 242 and 244 is an optional bottom wall 250, which slants inwardly from each of the panels. Bottom wall 250 leads to base 260 (See, especially Figs. 5-7), which comprises a peripheral ring 262 and an interior recessed area 264 within the ring. Interior recessed area 264 is divided in half by external rib 270

which projects outwardly from the surface of area 264. Within recessed area 264 is a waffle pattern, which may be in the form of a series of debossments 214 formed in the bottom panel 216 of the bottle. Alternatively, if desired, a series of embossments rather than debossments with respect to the bottom panel may be used. The embossments or debossments may be in the form of rectangles as shown in Fig. 5 or may assume another shape.

The described patterns of embossments or debossments provide enhanced structural strength, particularly for impact resistance.

As best seen from Figs. 1, 4 and 5, the body of the bottle has an octagonal cross section formed by panels 230, 232, 234, 236, 238, 240, 242 and 244. In the embodiment of Figs. 2, et seq., at each of the corners formed by intersection of the panels with each other, a vertically extending groove 210 is formed in the outer wall of the bottle. Alternatively, a rib (extending outwardly with respect to the outer surface of the container as opposed to the inwardly extending groove) may be employed in place of the groove. The grooves or ribs disposed at the panel intersections, in conjunction with the generally octagonal cross section and the highlight groove are believed to increase the rupture resistance of the bottle. However, it has been discovered that the grooves or ribs may be omitted and a suitable lightweighted bottle still obtained. Thus, in Fig. 1, no ribs or grooves are present at the corners. The octagonal shape itself is believed to contribute importantly to compressive or top load strength.

In addition to optional vertical grooves 210 at the bottle corners, optional horizontal grooves 212 and other optional vertical grooves 211 (not disposed at panel intersections),

which connect with some of the horizontal grooves may contribute to the integrity of the bottle, particularly impact resistance. As seen in part in Fig. 1, these grooves which also "highlight" certain features of the bottle, extend horizontally from the base of the handle, across the top of the rear panel, a corner panel, a portion of the side panel 238, and then upward along the top of the side panel, along the top of another corner panel, the front panel, a portion of the second side panel, then downwardly along the top of the second side panel, along the top of the next corner panel and then back along the top of the rear panel to return to the base of the handle. Again, ribs may be used instead of grooves here, as well. If desired, the bottle may be stippled, particularly above grooves 212 and 211, as illustrated in British registered design 2033440.

Another noteworthy advantage comes from the combination of the lightweight bottles and plastic in-mold labels (IML). In-mold label 310 on bottle is shown in Fig. 8. Even with their light weights they did not fail laboratory drop and ESCR tests. Current bottles at light weights normally fail at the edge of the labels, which creates an area of stress in the bottle front/back panels. By "in-mold label" it is meant that the label is placed in the mold halves before the mold halves are clamped around the parison and the bottle is blown against the mold walls. This takes the place of affixing the label to the bottle after molding.

Embodiments may include a conventional adhesive applied label or, indeed, no label.

The structure of the bottle of the invention permits use of lighter weight materials than would otherwise be possible. For instance, an empty 128 fluid oz heavy duty liquid container can be produced having approximately 1/2 the

normal weight for such containers (80 grams vs. the more usual 160 grams). Bottles according to the invention may have a gram weight reduction of from 25 to 33% as compared to bottles typically used for heavy duty liquid detergent products.

The use of a neck or finish which is displaced from the center is believed to facilitate pouring of product from the container. To determine whether a neck finish is off-center for the purposes of the invention, one measures the distance from one side to the other of the bottle's length, measured at the point of maximum length, i.e., the maximum horizontal dimension when the container is standing on its base. Then one determines the center point of that distance from one side to the other. The next step is to ascertain where the center point of the container finish, ie the center of the bottle mouth, falls along the line drawn from one side of the container to the other at its longest length. The percentage displacement is calculated by subracting the distance in position between the center point of the finish and the center of the container length at its widest point and dividing that figure by the length of the bottle at its widest point.

An example of the percentage displacement calculation is as follows. If the container has its maximum length at the bottom, and the length of the bottom is16 cm, and a vertical line drawn through the center of the finish intersects the length line at 10.6 cm, the calculation is as follows: (10.6 minus 8 (the midpoint of the length)), divided by 16. The result is 16.25%. For the purposes of the invention, a neck finish is considered off center if the displacement percentage is greater than 3%. Preferred displacments are from 3% through 20%. Especially preferred is if the percentage is from 5%-20%.

Use of a large [illegible]k or finish, eg on the order of from 50 to 88 [illegible] "glugging" of product emerging from the conta[illegible] distributes polymer in such a way as to increase the top load strength of the container. When a top load is applied, the force is more evenly distributed to the side walls of the mouth.

Advantageously, the bottle of the invention can be made on a wheel machine, i.e., a high speed production blow molding apparatus, or a Uniloy brand or other shuttle machine. A "wheel" machine rotates and clamps around a continuously extruded parison. Bottles are ejected after forming.

Bottles according to the invention which were 20% lighter than current heavy duty liquid bottles sold by a major detergent manufacturer, were found to be as sturdy, durable and vigorous as the full weight, current bottles.

It will be apparent that the pouring fitment and container of the invention may be used for liquid laundry and other detergents, fabric softeners and many other types of liquid household and other products.

As used herein, "handle" refers to a structure for holding the bottle where there is a "hole" through which the human hand can extend. A gripping feature is a pair of indentations facilitating the holding of the bottle by a human hand, but which does not include a "hole."

Examples of multi layer resins which may be used to make the bottles of the invention, are as follows:

Variable	Inside Layer	Middle Layer	Outside Layer
1	9503	9503-PCR/Regrind	9503/3% Colorant
3	9503	LX4570/PCR/Regrind	LX4570/3% Colorant
6	9346T	9602/PCR/Regrind	9602/3% Colorant

Note: 9503 = 0.948 density
LX4570 = 0.955 density
LX4225 = 0.950 density
9602 = 0.964 density
9346T = 0.945 density

It should be understood, of course, that the specific forms of the invention herein illustrated and described are intended to be representative only, as certain changes may be made therein without departing from the clear teachings of the disclosure. Accordingly, reference should be made to the following appended claims in determining the full scope of the invention.

THE EMBODIMENTS OF THE INVENTION IN WHICH AN EXCLUSIVE PROPERTY OR PRIVILEGE IS CLAIMED ARE DEFINED AS FOLLOWS:

1. A package comprising a downwardly extending body having from 6-10 axially extending side panels fabricated from multiple polymer layers.

2. The package according to claim 2 further comprising:

a) a finish having an annular mouth;
b) a body extending axially downwardly along a vertical axis from said finish to a base;
c) said body including a shoulder extending outwardly and downwardly below said finish;
d) said body including from 6-10 axially extending side panels extending axially downwardly below said shoulder;
e) a plurality of axially extending intersections being formed at intersections of at least some of said side panels;
f) at least 50% of said axially extending intersections comprising a groove or rib extending axially at least 60% of the distance along said intersection between said panels;
g) an optional tapered base panel extending from said side panels to said bottle base; and
h) a pour spout associated with said finish extending upwardly from a bottom wall having a product drainage aperture.

3. The container according to claim 2 wherein said pour spout and drainage aperture are provided by a fitment associated with said finish and including i) a generally annular side wall and ii) a bottom wall extending inwardly from the bottom of said side wall and including said product drainage aperture and

wherein said pour spout extends upwardly from said bottom wall generally concentrically with said side wall.

4. The container according to claim 2 wherein:

a) said finish comprises a locking ridge extending inwardly from said mouth;
b) said fitment is friction fit within said finish; and
c) said annular side wall frictionally abuts the locking ridge of said finish.

5. The container of claim 4 wherein said pour spout includes a longitudinal slot extending downwardly from the top rear of the spout in alignment with the drainage aperture and is separated from said aperture by a spout rear wall.

6. The container of claim 5 wherein said fitment further includes a generally annular rim extending radially outwardly from the top of said side wall.

7. The container of claim 6 wherein said fitment further comprises a product exit aperture in its side wall.

8. The container of claim 2 further comprising a closure having an end wall, an inner circumferential wall depending from said end wall, an outer circumferential wall concentric with and spaced from said inner circumferential wall, a web parallel to and spaced from said end wall and connecting said inner and outer circumferential walls, threads formed on the inside of said outer circumferential wall mating with outer threads on the finish.

9. The container according to claim 1 further comprising:

a) a finish having an annular mouth;and

b) a body extending axially downwardly along a vertical axis from said finish to a base;

c) said body including a shoulder extending outwardly and downwardly below said finish;

d) said body including from 6-10 axially extending side panels extending axially downwardly below said shoulder;

e) a plurality of axially extending intersections being formed at intersections of at least some of said side panels;

f) at least 50% of said axially extending intersections comprising a groove or rib extending axially at least 60% of the distance along said intersection between said panels:

g) said neck having a diameter within the range of 50 to 88 mm.

10. The container according to claim 1 further comprising:

a) a finish having an annular mouth;

b) a body extending axially downwardly along a vertical axis from said finish to a base;

c) said body including a shoulder extending outwardly and downwardly below said finish;

d) said body including from 6-10 axially extending side panels extending axially downwardly below said shoulder;

e) a plurality of axially extending intersections being formed at intersections of at least some of said side panels;

f) at least 50% of said axially extending intersections comprising a groove or rib extending axially at least

60% of the distance along said intersection between said panels: and

g) an in-mold label.

11. The container according to claim 1 further comprising:

a) a finish having an annular mouth;
b) a body extending axially downwardly along a vertical axis from said finish to a base;
c) said body including a shoulder extending outwardly and downwardly below said finish;
d) said body including from 6-10 axially extending side panels extending axially downwardly below said shoulder;
e) a plurality of axially extending intersections being formed at intersections of at least some of said side panels;
f) at least 50% of said axially extending intersections comprising a groove or rib extending axially at least 60% of the distance along said intersection between said panels: and an
g) off centered neck.

12. The container according to claim 1 further comprising:

a) a finish having an annular mouth;
b) a body extending axially downwardly along a vertical axis from said finish to a base;
c) said body including a shoulder extending outwardly and downwardly below said finish;
d) said body including from 6-10 axially extending side panels extending axially downwardly below said shoulder;

e) a plurality of axially extending intersections being formed at intersections of at least some of said side panels;

f) at least 50% of said axially extending intersections comprising a groove or rib extending axially at least 60% of the distance along said intersection between said panels:

g) said panels having a multilayer structure including an inner pigmented or non-pigmented high stress crack resistant layer, ii) an optional middle layer including a minimum of 25% recycled resin, and iii) a virgin resin outer layer.

13. The container of claim 2 wherein from 65-90% of the intersections including said groove or rib extending axially at least 60% of the distance along said intersections.

14. The container according to claim 2 wherein from 65-90% of said intersections include said groove or rib extending axially from 65-90% of the distance along said intersections.

15. The container according to claim 1 wherein said body includes 8 axially extending side panels extending axially downwardly below said shoulder.

16. The container of claim 1 wherein said container body has an inner layer with a stress crack resistance of at least 100 hours as measured using ASTM D1693-95.

17. The container of claim 8 wherein said container body has a drop strength such that a water filled bottle at 73°F will survive one 3 foot drop onto the base without rupturing.

18. The container of claim 1 having a compressive strength of at least 70 pounds.

19. The container of claim 1 further comprising

a) a finish having an annular mouth;
b) a body extending axially downwardly along a vertical axis from said finish to a base;
c) said body including a shoulder extending outwardly and downwardly below said finish;
d) said body including from 6-10 axially extending side panels extending axially downwardly below said shoulder; and
e) a plurality of axially extending intersections being formed at intersections of at least some of said side panels;
f) at least 50% of said axially extending intersections comprising a groove or rib extending axially at least 60% of the distance along said intersection between said panels:
g) said panels having a multilayer structure including i) an outer higher density material and ii) a layer including a minimum of 25% recycled resin.

20. The container according to claim 1 further comprising an integral handle or gripping surface.

21. The container according to claim 2 wherein said finish comprises internal threads which mate with external threads on said bottle finish.

22. The container according to claim 2 wherein the fitment has internal threads and is secured to the container by i) spin welding, ii) hot melt, or iii) electromagnetic welding using a metal-impregnated thermoplastic gasket.

23. The container according to claim 9 further comprising an integral handle or gripping surface.

24. The container according to claim 10 further comprising an integral handle or gripping surface.

25. The container according to claim 11 further comprising an integral handle or gripping surface.

26. The container according to claim 12 further comprising an integral handle or gripping surface.

27. The container according to claim 19 further comprising an integral handle or gripping surface.

28. The container of claim 1 wherein said panels have a multilayer structure including an inner pigmented or non-pigmented high stress crack resistant layer, ii) an optional middle layer including a minimum of 25% recycled resin, and iii) a virgin resin outer layer.

29. The container of claim 1 wherein said panels having a multilayer structure including i) an outer higher density material and ii) a layer including a minimum of 25% recycled resin.

30. The bottle according to claim 1 fabricated from a polymer bilayer.

31. The bottle according to claim 1 and substantially as described herein.

FIG. 1

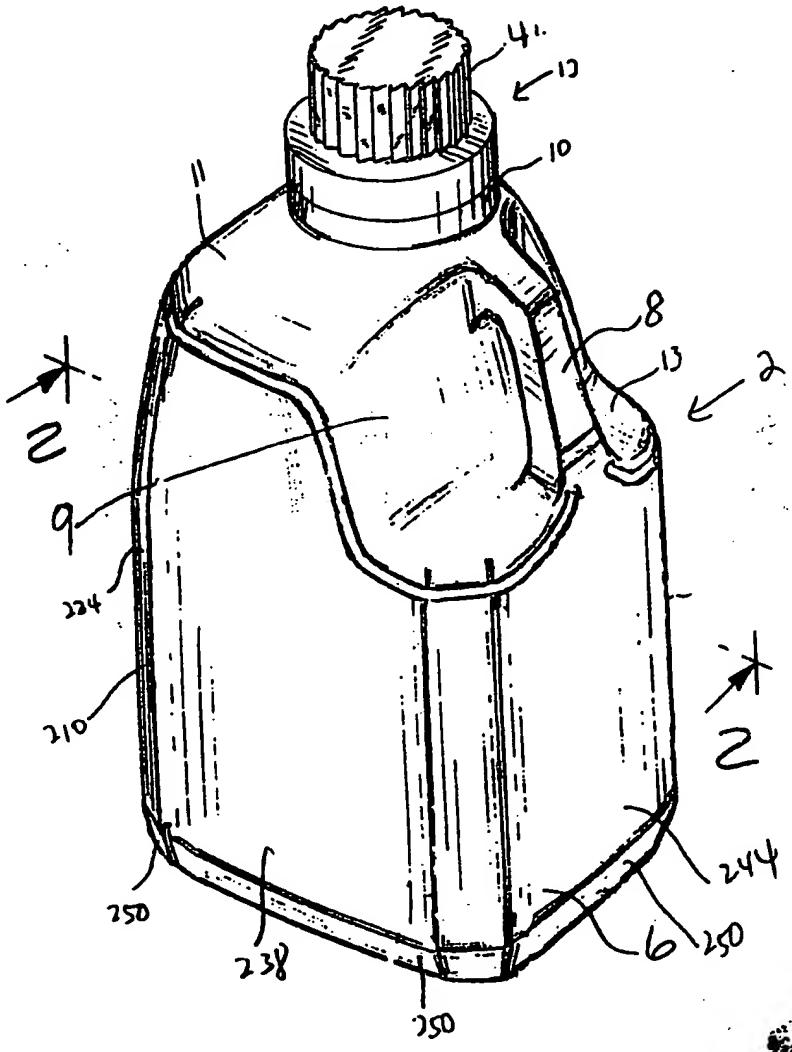
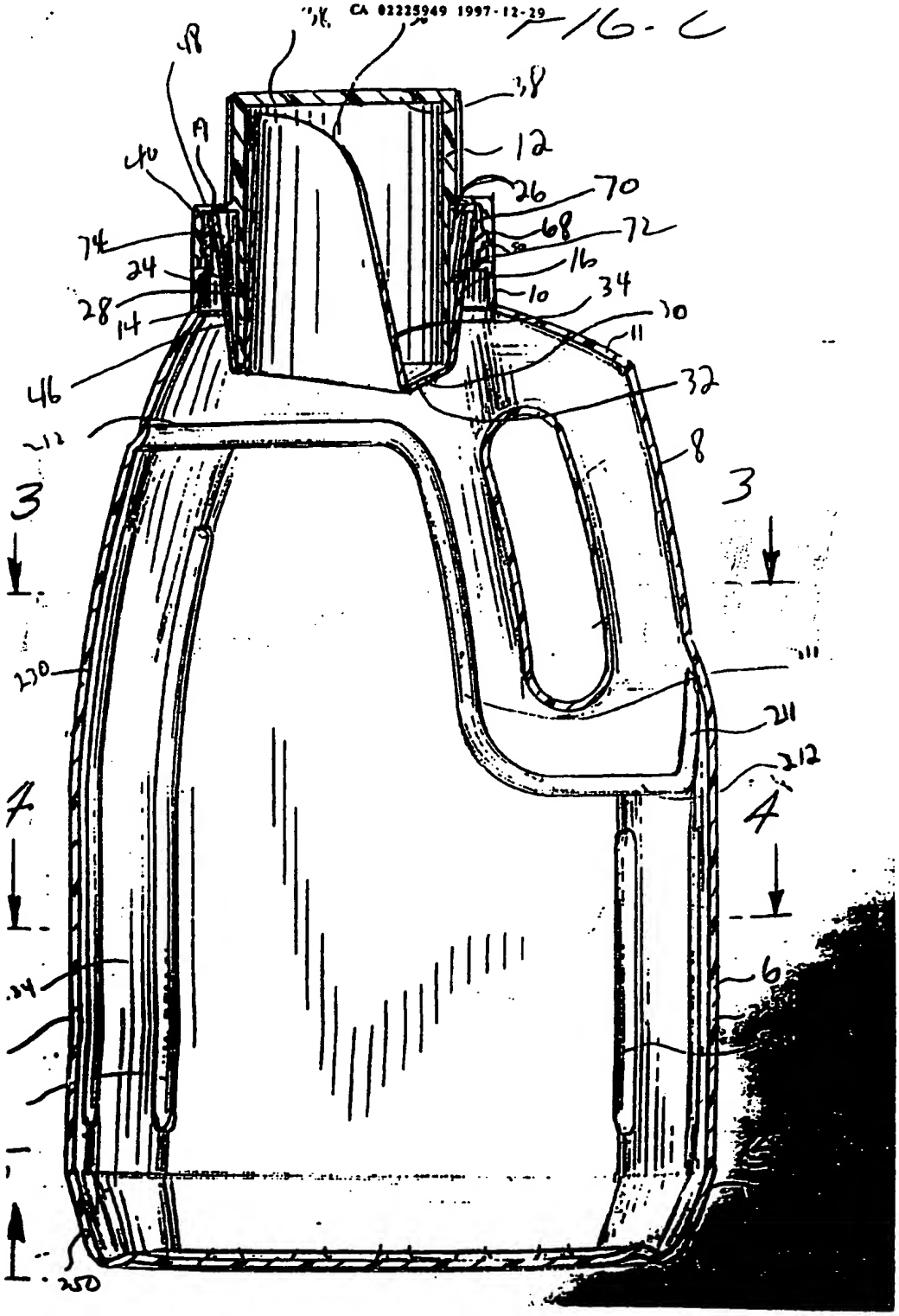


FIG. 16-C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4
6

FIG. 5

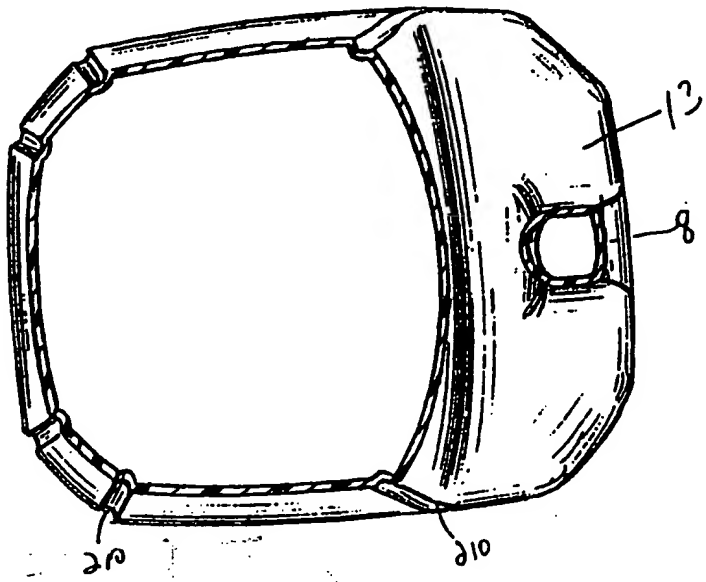
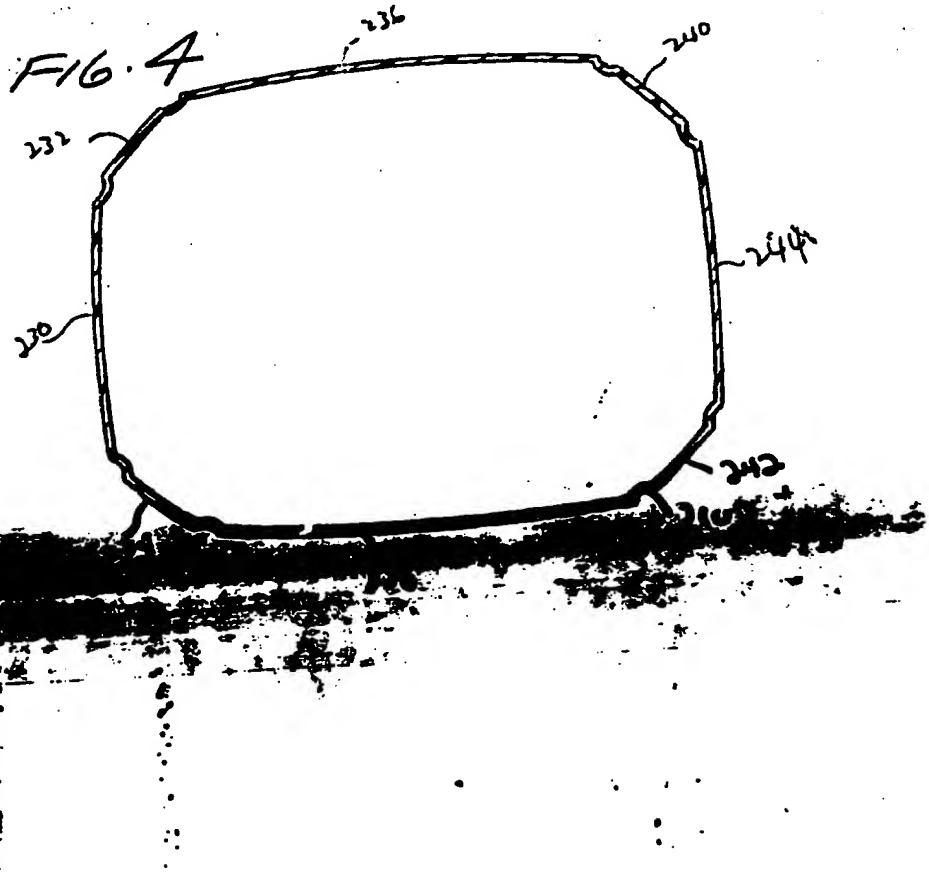


FIG. 4



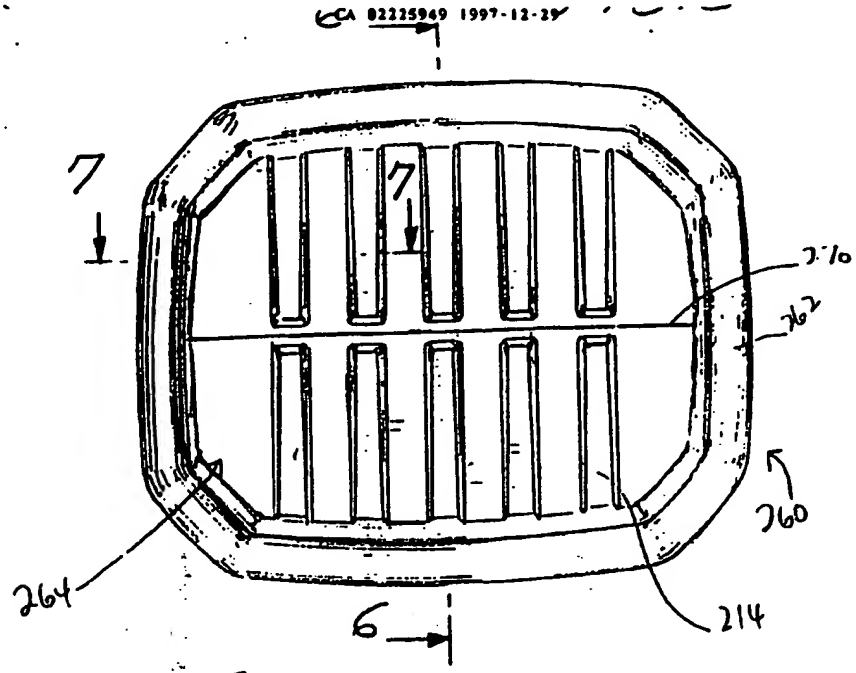


FIG. 6

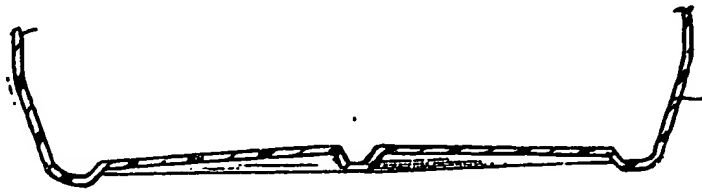


FIG. 7

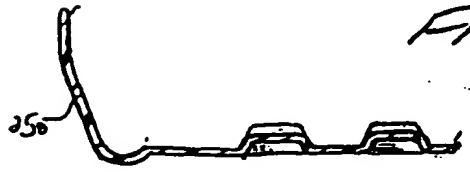


FIG. 8